

APPLICATION FOR PATENT

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Title: CONNECTOR WITH OPPOSITE-FACING PORTS

FIELD AND BACKGROUND OF THE INVENTION

10 The present invention relates to connectors for connecting peripheral devices to host devices such as computers and, more particularly, to a dual USB connector with opposite-facing ports.

Figures 1A and 1B are, respectively, top and partial back views of an ASUS P4P800 Deluxe motherboard **50**, made by ASUSTeK Computer Inc. of Taipei, 15 Taiwan. Specifically, Figure 1B shows the back plane of motherboard **50**. As described in ASUS P4P800 Deluxe – User Guide, E1323, Revised Edition V3 (ASUSTeK Computer Inc., May 2003), motherboard **50** includes the following components:

ATX 12V connector **1**

20 CPU socket **2**

North Bridge controller **3**

DDR DIMM sockets **4**

ATX power connector **5**

Super I/O controller **6**

25 Floppy disk connector **7**

IDE connectors **8**

AGP slot **9**

Serial ATA connectors **10**

Speech controller **11**

- RAID Ultra ATA/133 connector **12**
- Flash ROM **13**
- South Bridge controller **14**
- ATA133 RAID controller **15**
- 5 Standby Power LED **16**
- WiFi slot **17**
- 1394 controller **18**
- PCI slots **19**
- Audio CODEC **20**
- 10 Gigabit LAN controller **21**
- PS/2 mouse port **22**
- Parallel port **23**
- IEEE 1394 port **24**
- RJ-45 Ethernet port **25**
- 15 Line-In jack **26**
- Line-Out jack **27**
- Microphone jack **28**
- Four USB 2.0 ports **29** and **30**
- Serial port **31**
- 20 S/PDIF output port **32**
- Keyboard port **33**
- USB ports **29** and RJ-45 port **25** are housed in a common connector **52**. Similarly, USB ports **30** and IEEE 1394 port **24** are housed in a common connector **54**. All four USB ports **29** and **30** face outward, and are suitable for connecting, to a host device such as a computer that is based on motherboard **50**, an external USB
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peripheral device with a suitable form factor, such as the DiskOnKey™ flash memory device made by M-Systems Flash Disk Pioneers, Ltd. of Kfar Saba, Israel.

Other connectors in motherboard **50** include a connector **60** that houses PS/2 mouse port **22** and keyboard port **33**, a connector **62** that houses parallel port **23**, and a connector **64** that houses Line-In jack **26**, Line-Out jack **27** and microphone jack **28**.

Figure 2 is a line drawing of connector **52** detached from motherboard **50**, showing USB ports **29** and RJ-45 port **25** in a common housing **58**. Pins **56** at the base of housing **58** are for connecting connector **52** electrically and mechanically to motherboard **50**.

Because USB ports **29** of connector **52** and USB ports **30** of connector **54** face outward when connectors **52** and **54** are mounted on motherboard **50**, only external USB peripheral devices can be connected to motherboard **50**, or to a host device such as a computer that is based on motherboard **50**, at ports **29** and **30**. In particular, a system designer is prevented from incorporating a USB flash memory, such as a DiskOnKey™, as an internal component of motherboard **50**.

SUMMARY OF THE INVENTION

The present invention is a connector whose ports face in different directions. In particular, if two ports of the connector face in opposite directions, a system designer is free to use one of the ports, when the connector is mounted on a motherboard, to connect to the motherboard, as an internal peripheral device of a host system based on the motherboard, a device that has the same form factor as a similar device that would connect to the other port as an external peripheral device. Note that in the present context a “port” is understood to be an arrangement, typically but not necessarily a recess, in the connector, that facilitates a mechanical and electrical

connection of the connector to a peripheral device. So, for example, pins **56** at the base of housing **58** of connector **52** are specifically *not* a port as herein understood because pins **56** connect to motherboard **50** and not to a peripheral device.

Therefore, according to the present invention there is provided a connector for 5 connecting a host device to at least one peripheral device, including: (a) a first port, facing in a first direction; and (b) a second port, facing in a second direction substantially different from the first direction.

Preferably, the two ports face in opposite directions.

Preferably, the two ports are substantially functionally identical, meaning that 10 both ports provide substantially the same kind of mechanical and electrical connection to the connector. An important special case of this is that in which both ports are USB ports.

The scope of the present invention also includes a system board that incorporates the connector of the present invention and a host device that incorporates 15 the system board of the present invention. Most commonly, the host device is a computer; but the host device could alternatively be a network router, a TV set top box or a mobile device. Note that the system board of a computer generally is called a “motherboard”, so that in the context of the host device being a computer, the terms “system board” and “motherboard” are synonymous. Preferably, in the system board 20 and in the host device, one of the ports faces inward and the other port faces outward. Most preferably, the system board or the host device also includes an internal peripheral device operationally connected to the inward-facing port.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is herein described, by way of example only, with reference to the accompanying drawings, wherein:

FIGS. 1A and 1B are top and partial rear views of a prior art motherboard;
5 FIG. 2 is a line drawing of a prior art connector of the motherboard of FIG. 1B;

FIGS. 3A and 3B are line drawings of a connector of the present invention;
10 FIG. 4 shows a back plane of a motherboard that includes the connector of FIGs. 3A and 3B;
FIG. 5 is a top view of the motherboard of FIG. 1A, modified according to the present invention, and with a DiskOnKey™ flash memory connected to the inward-facing USB port.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

15 The present invention is of a connector with ports that face in different directions. Specifically, the present invention can be used to connect one peripheral device to a host device on the inside of the host device while leaving open the option of connecting a second, similar peripheral device to the host device on the outside of the host device.

20 The principles and operation of a connector according to the present invention may be better understood with reference to the drawings and the accompanying description.

Referring again to the drawings, Figures 3A and 3B are line drawings, from opposite sides, of a connector 70 of the present invention. Connector 70 is similar to 25 connector 52, sharing with connector 52 RJ-45 port 25 and pins 56 in housing 58.

Instead of two USB ports **29** that face in the same direction as RJ-45 port **25**, connector **70** has one USB port **72** that faces in the same direction as RJ-45 port **25** and another USB port **74** that faces in the opposite direction to RJ-45 port **25**.

Figure 4 shows the back plane of a motherboard **80** that is identical to motherboard **50** except for having connector **70** substituted for connector **52**. When connector **70** is mounted on motherboard **80** as shown, USB port **72** faces outward along with RJ-45 port **25** and USB port **74** faces inward.

A system designer of a host device based on motherboard **80** is free to include in his or her design an internal USB peripheral device connected to USB port **74** while leaving USB port **72** free for a user of the host device to connect therewith an external USB peripheral device to the host device. For example, a DiskOnKey™ flash memory could be connected to USB port **74** to serve as one of the non-volatile memories of the host device. Figure 5 shows motherboard **80** with a DiskOnKey™ flash memory **90** connected to USB port **74**.

Although it is preferred that USB ports **72** and **74** face in opposite directions as shown, this relative orientation of USB ports **72** and **74** is not an obligatory feature of the present invention. For example, in another embodiment of the connector of the present invention, USB ports **72** and **74** are on two adjacent sides of connector **70** and so are oriented at a 90 degree angle relative to each other. This embodiment could, for example, be mounted on a motherboard in the corner position occupied by connector **60** in motherboards **50** and **80**, to allow two external USB peripheral devices to be mounted on two different sides of a host device that is based on that motherboard.

While the invention has been described with respect to a limited number of embodiments, it will be appreciated that many variations, modifications and other applications of the invention may be made.